



US009410213B2

(12) **United States Patent**
Matheny et al.

(10) **Patent No.:** **US 9,410,213 B2**
(45) **Date of Patent:** **Aug. 9, 2016**

(54) **BACILLUS STRAINS AND COMPOSITIONS**

- (71) Applicant: **Envera, LLC**, West Chester, PA (US)
(72) Inventors: **Michael Matheny**, Landenberg, PA (US); **Zivile Panaviene**, Wayne, PA (US)
(73) Assignee: **Envera, LLC**, West Chester, PA (US)
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 146 days.

(21) Appl. No.: **14/254,937**

(22) Filed: **Apr. 17, 2014**

(65) **Prior Publication Data**

US 2014/0315716 A1 Oct. 23, 2014

Related U.S. Application Data

(60) Provisional application No. 61/854,062, filed on Apr. 17, 2013.

(51) **Int. Cl.**

A01N 63/00 (2006.01)
C12R 1/07 (2006.01)
C02F 3/34 (2006.01)

(52) **U.S. Cl.**

CPC . **C12R 1/07** (2013.01); **A01N 63/00** (2013.01);
C02F 3/34 (2013.01)

(58) **Field of Classification Search**

None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,524,842 B1 2/2003 Vainberg et al.
2009/0260107 A1 10/2009 English et al.

OTHER PUBLICATIONS

Heyrman et al., "Study of Mural Painting Isolates, Leading to the Transfer of '*Bacillus maroccanus*' and '*Bacillus carotarum*' to *Bacillus simplex*, emended description of *Bacillus simplex*, re-examination of the strains previously attributed to '*Bacillus macroides*' and Description of *Bacillus muralis*", International Journal of Systematic and Evolutionary Microbiology, 2005, vol. 55, pp. 119-131.

Gomaa et al., "16S rRNA Characterization of a *Bacillus* Isolate and its Tolerance Profile After Subsequent Subculturing", Arab J. Biotech., 2007, vol. 10, No. 1, pp. 107-116.

Kuisiene et al., "*Bacillus butanolivorans* sp. nov., a species with industrial application for the remediation of n-butanol", International Journal of Systematic and Evolutionary Microbiology, 2008, vol. 58, pp. 505-509.

Primary Examiner — Thane Underdahl

(74) *Attorney, Agent, or Firm* — McCarter & English, LLP

(57)

ABSTRACT

In one aspect, the present invention relates to novel *Bacillus* strains ENV 734 (NRRL B-50800), ENV 735 (NRRL B-50801), ENV 736 (NRRL B-50802), and ENV 737 (NRRL B-50803). These strains possess a high degree of homology with both *Bacillus simplex* and *Bacillus butanolivorans*, but unexpectedly exhibit desirable high salt tolerance as well as low temperature growth and urease production. In another aspect, the present invention relates to compositions comprising at least one of such strains and an acceptable carrier, and methods of preparing the compositions. Such compositions are suitable for use in industrial, agricultural, aquacultural, environmental, wastewater treatment and/or probiotic applications. Methods for enhancing the growth of a plant propagative material and methods for treating wastewater are also provided.

20 Claims, No Drawings